**Isomers**

#### ****1.**** (i) Define the term constitutional (structural) isomer.

#### 

#### (ii) Explain why 1,1-dichloroethene cannot exist as a *cis*-*trans* isomer.

**(iii)** A structural isomer of 1,1-dichloroethene canexist as *cis*-*trans* isomers. Draw and name the *cis*-*trans* isomers.

#### ****2.**** The structures of three organic compounds are shown below.

#### 

Explain why compound **A** can exist as geometric (*cis* and *trans*) isomers, but compounds **B** and **C** cannot.

In your answer you should:

• draw the geometric (*cis* and *trans*) isomers of compound **A** in the boxes below

#### • explain the requirements for geometric (*cis* and *trans*) isomers by referring to compounds A, B, and C.

#### ****3.****

#### 

#### (a) Identify two molecules from the table in (a) that are constitutional (structural) isomers of each other. Justify your choice.

#### (b) Molecule D can exist as geometric (cis and trans) isomers. (i) Draw the geometric (cis and trans) isomers for molecule D

#### (ii) Justify why molecule D can exist as geometric (cis and trans) isomers. Your answer should include:

#### • an explanation of the requirements for cis and trans isomers

#### • reference to the structure of molecule D.

#### 4. Four of the structural isomers of C4H10O are alcohols. Draw each of these showing their structural formulae and IUPAC (systematic) names.

**5.** Can but-1-eneexist as geometric (*cis-trans*) isomers?

Justify your answer, including reference to the requirements for geometric (*cis-trans*) isomers.

**6a)** Draw the TWO structural isomers of C2H2Cl2 AND name the isomers.

**b)** One of the structural isomers from (a) can exist as geometric isomers (*cis-trans*).

**i)** Name the isomer that can exist as geometric isomers.

**ii)** Draw the geometric isomers of this molecule

**c)** Discuss why the organic molecule C2H4Cl2 forms structural isomers but does not form geometric isomers whereas the molecule C2H2Cl2 forms both structural AND geometric isomers.

In your answer, you must include:

* a description of each type of isomer (geometric or structural)
* the characteristics of molecules that form these types of isomer
* the structural formulae and functional groups of both C2H4Cl2 AND C2H2Cl2.

**7.**

****

Only **Molecule C** can exist as geometric (*cis-trans*) isomers. Draw the geometric (*cis-trans*) isomers of **Molecule C**

Discuss why **Molecule C** can exist as geometric (*cis-trans*) isomers but **Molecule A** and **Molecule B** cannot exist as geometric isomers.

In your answer you must include an explanation of what a geometric isomer is.

**8.**

|  |  |
| --- | --- |
| **A** | **B** |
| **C** | **D** |

Identify TWO molecules that are structural isomers of each other using the **bold** letters from the table above.

Identify ONE molecule that can exist as geometric (*cis*–*trans*) isomers using the **bold** letter from the table above.

Draw the *cis* and *trans* isomers for your chosen molecule

Discuss why the molecule you have selected can exist as *cis*–*trans* isomers.

Your answer must include:

• an explanation of why *cis–trans* isomers can exist

• reference to the structure of the selected molecule

**9.** Draw ALL the structural isomers of alkenes of molecular formula C4H8

**10.** Four different molecules with the molecular formula C5H10 are given below.

|  |  |
| --- | --- |
| **A** | B |
| **C** | **D** |

a) Describe why these molecules are **structural isomers**.

b) One of the molecules shown above may exist as ***cis-trans* isomers**.

(i) Identify this molecule using the **bold** letter from the above table.

(ii) Draw the *cis* and *trans* isomers of the molecule identified in (i).

c) Discuss why the molecule you selected in (b)(i) may exist as *cis-trans* isomers, while the other three isomers cannot

11. Consider the following compounds.

|  |  |  |  |
| --- | --- | --- | --- |
| **E** | **F** | **G** | **H** |
| Q2, Comp A, 90309 | Q2, CompB, 90309 | Q2, Comp C, 90309 | Q2, Comp D, 90309 |
|  |  |  |  |

a) Which compounds are structural isomers? Identify using the bold letters designating the molecules.

b) Explain why the compounds you have selected are structural isomers.

**12.** Structural isomers of the molecular formula C2H2Cl2 are 1,1–dichloroethene and 1,2–dichloroethene.

a) Circle the compound that can exist as *cis-trans* isomers: 1,1–dichloroethene or 1,2–dichloroethene

b) Draw the *cis* and *trans* isomers of the compound you circled in (a).

c) Discuss the requirements for *cis-trans* isomerism. In your answer include reasons explaining why the structural isomer you selected above can exist as *cis-trans* isomers while the other structural isomer

cannot.

**13.** Two alkenes, but–1–ene and but–2–ene, are structural isomers of the compound with the molecular formula, C4H8

|  |  |
| --- | --- |
| CH2=CH–CH2–CH3  but–1–ene | CH3–CH=CH–CH3  but–2–ene |

a) Draw and name **another** structural isomer of the compound, C4H8.

b) But–2–ene can exist as geometric (*cis–trans*) isomers, whereas but–1–ene cannot. Explain this difference.

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